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Northwest Territories Renewable Resources

AIR QUALITY MONITORING IN THE YELLOWKNIFE AREA

1990 DATA

The Department of Renewable Resources participates in two national air quality monitoring programs. Participation in the National Air Pollution Sampling Network (NAPS) provides long-term monitoring of trends in urban (Yellowknife) air quality. The Canadian Air and Precipitation Monitoring Network (CAPMoN) station, located at the Snare Rapids hydro-electric site, was established to monitor the level of acid rain transported into the area by weather systems.

WHAT WERE THE 1990 RESULTS FROM YELLOWKNIFE NAPS STATION?

The Yellowknife NAPS station is located in the downtown area on the roof of a two story building. Every six days a sample is collected over a 24 hour period. These samples are analyzed for lead, arsenic, nitrate, sulphate and Total Suspended Particulates (TSP) a parameter which includes dust. Results from the 1990 period are summarized below.

1990 YELLOWKNIFE AIR QUALITY DATA

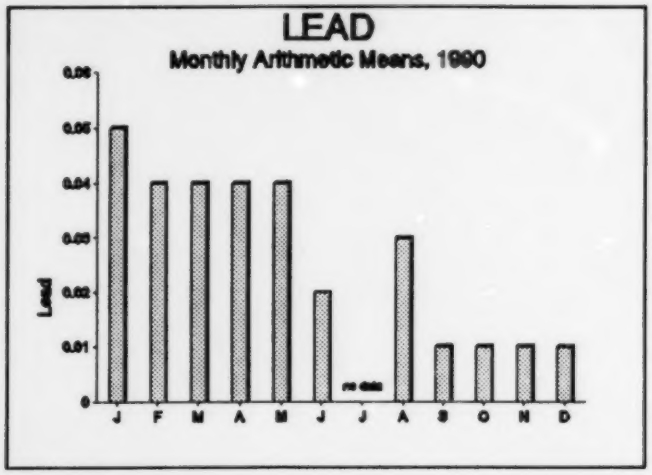
EXPOSURE	LEAD	ARSENIC	NITRATE	SULPHATE	TSP
highest (24 hr.)	0.12	0.039	1.1	5.3	704
lowest (24 hr.)	0.00	0.003	0.0	0.9	8
Annual geometric mean	0.02	0.009	0.3	2.3	63

Note: all units in micrograms per cubic metre.

While the overall air quality for all of Yellowknife cannot be defined on the basis of the air quality measured at this single monitoring station, the data does provide a measure of air quality in downtown Yellowknife. Each of the pollutants measured are discussed in greater detail on the following pages.

LEAD

Lead levels in Canadian air have been dropping since 1975 when lead-free gasoline was introduced to the market. In 1990 leaded gasoline was removed completely from the Canadian marketplace. A decline in levels of lead similar to national trends has been measured in Yellowknife where combustion of gasoline is the only significant source of lead. There are no national standards for lead in air. Ontario has set a limit of 5.0 micrograms per cubic metre ($\mu g/m^3$) over 24 hours.



In 1990, the annual geometric mean level of lead in Yellowknife air was 0.02 $\mu g/m^3$. The highest level of lead measured over a 24 hour period in 1990 was 0.12 $\mu g/m^3$ in January. Lead levels dropped during 1990 until by early October the 24 hour averages did not rise above 0.01 $\mu g/m^3$.

Ten years earlier, in 1980, the annual geometric mean level of lead measured in Yellowknife was 0.23 $\mu g/m^3$. The highest level of lead measured over a 24 hour period in that year was 0.7 $\mu g/m^3$.

TOTAL SUSPENDED PARTICULATE (TSP)

TSP is a generic term for airborne particles including smoke, dust, fly ash and pollen. Lead, arsenic and nitrogen and sulphur compounds are often present in the atmosphere in a particulate form. In Yellowknife a major source of TSP is dust from gravel and sand on roads, alleyways and parking lots . In the spring especially, and during the summer, this dust is blown about by the wind or raised into the air by vehicle traffic. There is a distinct seasonal variation in TSP levels in Yellowknife.

Standards for TSP have been established under the Canadian Environmental Protection Act.

Air quality objectives for suspended particulate matter

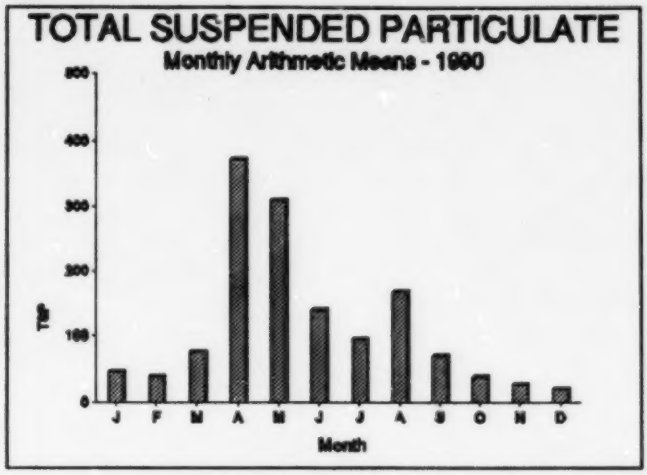
Exposure period	Maximum desirable concentration ($\mu g/m^3$)	Maximum acceptable concentration ($\mu g/m^3$)	Maximum tolerable concentration ($\mu g/m^3$)
24 hours	—	120	400
One year	60	70	—

Maximum desirable concentration provides a long term goal for air quality.

Maximum acceptable concentration is intended to provide adequate protection against effects on the environment, materials, visibility and personal comfort and well being.

Maximum tolerable concentration denotes levels of air contaminants beyond which appropriate action is required without delay to protect the health of the general population.

On April 23, 1990, the TSP level was 696 $\mu g/m^3$, on April 29 the level was 524 $\mu g/m^3$ and on May 5 reached 704 $\mu g/m^3$, the highest level of the year. Between April and August, TSP levels in Yellowknife were within the acceptable range (under 120 $\mu g/m^3$) 39% of the time, were within the tolerable range (between 120 to 400 $\mu g/m^3$) 44% of the time and exceeded the tolerable limit 17% of the time.



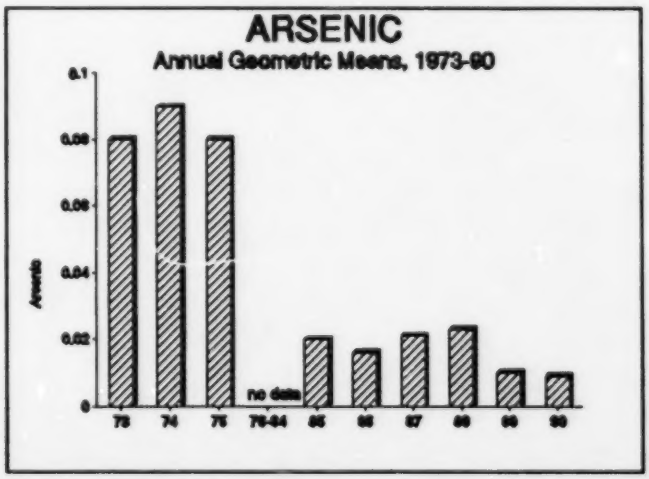
Although dust levels are high during the warm months, the levels measured during the rest of the year are low enough that the annual geometric mean in 1990 was 63 $\mu g/m^3$, a level that is within the acceptable range. In 1989, the annual geometric mean for TSP was also 63 $\mu g/m^3$.

ARSENIC

Arsenic is naturally present in the Yellowknife environment where the mineral arsenopyrite is commonly found in the bedrock. The production of gold can lead to the introduction of arsenic into the atmosphere. Measures undertaken in the late 1970's led to reductions in arsenic releases to the atmosphere caused by gold mining. There are no national standards for arsenic in the air. In 1991 the Province of Ontario set a limit of 0.3 $\mu g/m^3$ for arsenic over a 24 hour period.

Arsenic is not usually measured in other cities participating in the NAPS program, but because of concerns raised in the past is measured in Yellowknife.

In 1990, the annual geometric mean arsenic level in Yellowknife was 0.009 $\mu g/m^3$, and the highest level measured over a 24 hour period was 0.039 $\mu g/m^3$.



These levels are considerably lower than levels detected in the mid 1970's when Environment Canada's Environmental Protection Service monitored arsenic levels in Yellowknife.

NITRATE AND SULPHATE

Nitrogen oxide compounds and sulphur dioxide are oxidized in the atmosphere to form, respectively, nitrate and sulphate. Both of these compounds are pollutants that can increase acidity in precipitation. Sulphur dioxide is released through the combustion of fossil fuels and, in the Yellowknife area, through gold roasting activities. Nitrogen oxide compounds, formed during high temperature combustion, can also play an important role in ground level ozone formation in cities where smog is a problem. Smog is not considered to be a problem in Yellowknife. Although there are no set standards for nitrate and sulphate, levels detected in Yellowknife compare favourably with levels detected in other Canadian cities.

IS ACID RAIN MEASURED IN THE NORTHWEST TERRITORIES?

A Canadian Air and Precipitation Monitoring Network (CAPMoN) station was established in October 1986 at the Snare Rapids hydro site (about 150 km north of Yellowknife) to measure acid precipitation and associated parameters.

Acidity in precipitation is compared based on the measurement of pH, with lower pH values indicating higher acidity. Sulphate and nitrate dissolved in precipitation are indirect measurements of acidic gas emissions from industry and automobiles. Ammonium, sodium, calcium, magnesium and potassium are measures of the acid-neutralizing capacity of the atmosphere.

1990 CAPMoN DAILY PRECIPITATION QUALITY

STATION	pH	Sulphate	Nitrate	Chloride	Ammonium	Sodium	Calcium	Magnesium	Potassium
Snare Rapids NWT	5.12	0.50	0.07	0.07	0.123	0.02	0.06	0.01	0.02
Esther Alberta	5.39	1.74	0.38	0.11	0.545	0.12	0.58	0.11	0.10
Cree Lake Sask.	5.03	0.87	0.14	0.05	0.235	0.02	0.08	0.02	0.03
Chalk River Ontario	4.33	2.94	0.65	0.16	0.466	0.06	0.32	0.05	0.04
Sutton Quebec	4.40	3.30	0.68	0.19	0.452	0.06	0.23	0.03	0.03

Note: all units in milligrams per litre (mg/l) except pH.

The preceding table shows a comparison of 1990 data from Snare Rapids with data collected over the same period from other stations in Canada. CAPMoN sites in eastern Canada (Chalk River and Sutton) are located in regions where "acid rain" is of great concern. The higher acidity (lower pH) at those stations may be due to the influence of industrial pollutants.

Results from samples collected at Snare Rapids during 1990 are consistent with those from previous years. Rain and snow pH levels together with the low levels of the other parameters indicate there is negligible pollution in precipitation at Snare Rapids.

How Does Air Quality in Yellowknife Compare With Other Canadian Cities?

Except for the high TSP levels, Yellowknife compares favourably with other Canadian cities in terms of air quality. This is to be expected considering the relatively low level of industrial activity in the area. Yellowknife also benefits in that there is virtually no background level of air pollution carried in by the wind.

A considerable proportion of the air pollutants released into the air in Yellowknife are generated by burning fossil fuels to heat buildings and to operate motor vehicles. Combustion of fossil fuels is considered to account for much of the lead, nitrate and sulphate in Yellowknife air. The high TSP levels in Yellowknife are caused by dust being repeatedly raised by wind and traffic.

1990 AIR QUALITY DATA FROM OTHER CANADIAN CITIES

LOCATION	LEAD	NITRATE	SULPHATE	TSP
Quebec City	0.03	0.34	1.76	28
Ottawa	0.01	0.60	3.77	27
Hamilton	0.03	3.25	10.96	69
Winnipeg	0.03	0.62	1.40	36
Regina	0.02	0.61	2.13	41
Vancouver	0.04	0.95	3.03	27
Whitehorse	0.02	0.29	1.68	28
Yellowknife	0.02	0.30	2.25	63

Note: The above data are annual geometric means collected through the NAPS program and are expressed in micrograms/cubic metre.

For More Information Please Contact:

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